PEST TECHNOLOGY
Pest Control and Pesticides

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Summer

GLORIOUS SUMMER complete with sun, blue skies and Yorkshire C.C.C. restored to its rightful place. Gone are the remarks on Manchester's weather and the renowned character who would say: "When I was young etc." has had to confine his philosophy to the younger generation and like subjects, or prophesy a hard and bitter winter. Indeed some, if not all, meteorologists believe that fine warm summers are here for the next twenty years, however, the cautious ones safeguard themselves by stating that only on an average will the seasons be fine.

With the notable exception of certain Water Boards, who have a water shortage after two or three weeks of dry weather notwithstanding the fact that there may have been ample rainfall for the best part of the year, the majority of the population would welcome the predicted conditions.

However, fine warm weather has its accompanying disadvantages. There is really no need to tell our readers that many weeds and insect pests thrive in such conditions and that only a relatively short spell of warm weather can cause insect populations to shoot up to epidemic proportions. Should these summers materialise keen observation will be necessary to give notification of developing insect outbreaks before they can cause serious damage. The use of pesticides can be expected to increase and the rapid coverage attained with aerial application should pay dividends by controlling insect outbreaks in their early stages.

It must not be overlooked, however, that with an increasing use of insecticides we must be alert for any signs of the development of resistance. Several well known scientists have advocated the formation of a central body to collect and evaluate information on this subject, perhaps this could be arranged.

All methods of pest control both old and new, cultural and chemical should be examined and evaluated so that in the event of an insect pest developing resistance to one group of insecticides there will be an alternative method of combating the pest.

Perhaps it will be thought that this is a very pessimistic attitude to take but fore-warned is fore-armed.

A NOVEL SAFETY PACK FOR TOXIC MATERIALS

By DR. M. A. PHILLIPS, F.R.I.C., M.I.Chem.E.*

THE concentrated form of many insecticides are toxic to man and other mammals, although the actual toxicity varies considerably from one to another. The Agriculture (Poisonous Substances) Regulations apply very properly to such insecticides, even to those which are classified as Schedule 2, Part 3 substances and certain protective clothing has by law to be worn whilst handling or diluting these concentrates.

The packing of these concentrates is hence a matter of some importance and precautions are taken by manufacturers of these products, particularly when flocculant dusts are being packed and are later to be unpacked and handled.

The provision, therefore, of a safety pack is of considerable interest to the industry.

Polyvinyl alcohol is a product of hydrolysis of polyvinyl acetate, itself made by polymerisation of monomeric vinyl acetate. The degree of hydrolysis of polyvinyl acetate varies and products are obtainable containing from 50% of the alcohol up to and exceeding 87% of polyvinyl alcohol. If the degree of polymerisation of the poly alcohol is not too great, a product of hydrolysis containing about 80% or more of its acetyl groups converted into hydroxy groups is truly soluble in water and polyvinyl alcohols in the form of sheets and of this constitution can be obtained in this country as well as from Germany, the United States and elsewhere. Such sheets can be obtained in thicknesses of from 0.02 to 0.1 and 0.2 mm.; that between 0.04 and 1.0 mm. thick has a substantial tensile strength, enabling it to be handled very easily and without tearing, if kept dry. It can be heat sealed by, for example, impulse electrical heat sealing machines such as are used for sealing polythene sheet and such seals can be made quite hermitic and strong.

Toxic products such as insecticides may be enclosed in this type of pack† which is, of course, to be itself packed in a metal outer, properly sealed against the entry of water. For field use, the outer seal is broken, the complete water-soluble pack removed manually (and this can be done in complete safety and, in the view of the writer, without any physical necessity for the use of protective clothing or for the wearing of rubber gloves) and placed in the spray tank which should be well agitated, preferably by a power operated paddle. It may in some cases be advisable to wear proper goggles during this dilution operation, particularly if the operator insists upon peering into the interior of the tank. This is not, however, a necessary part of the dissolving operation. After the dilution, the appropriate part of the Agriculture (Poisonous Substances) Regulations apply just as for the more orthodox method of pack.

The time required for complete solution will vary with the thickness of the polyvinyl sheet, but not by a great deal; however, a standard thickness of 0.04 mm. is advised for this pack which is strong enough for all purposes. The pack will normally contain the insecticide, a wetting agent (solid such as Nansa or piquid such as Lissopol NX) and it is a sound idea to incorporate a dye which, in addition to being a further safety factor generally, also indicates to the operator, the time at which the pack begins to break up. Complete solution follows very soon after this.

These packs are more suitable for spray tanks which use a power operated mechanical agitator, that is, for most fruit spraying equipment—they are less suitable for tanks agitated by re-circulation pumps if the re-circulation axtiom is feeble since the time for complete solution may tend to exceed that normally given by the spray contractor or sprayer. However, if the latter is not in too much of a hurry and can give 15-20 minutes for solution and will watch for the first appearance of the dye colour before beginning to travel with the tank to the spraying site, these packs can be used for such spray tanks using re-circulation agitation.

For power operated spray tanks, the time for complete solution may be measured in minutes as shewn in the table below; there is no tendency in practice for spray

jets to choke and no particles of undissolved polyvinyl alcohol is to be found in the filters.

TABLE 1. October, 1958. Hydraulux 3-ram pump with mechanical agitator in tank. Fluoroacetamide with alkyl aryl sulphonate wetter; Total weight of pack contents 5 ounces. Added at autumn outside temperature to 50 gallons water.
Bag began to break up in 4 minutes, 3 minutes, 4 minutes.
Complete solution in 6 minutes, 6 minutes, 6 minutes.
(3 *separate experiments*)

TABLE 2. March, 1959. Terrington special spray plant with mechanical agitator in tank. Fluoroacetamide with alkyl aryl sulphonate wetter. Total weight of pack contents 8 ounces. Added at spring outside temperature to 50 gallons of water.
Bag began to break up in 3½ minutes, 3½ minutes, 3½ minutes, red dye indicator.
Complete solution in 7 minutes, 6 minutes, 8 minutes.
(3 *separate experiments*)

Patents are pending for the application of the above ideas in practice.**

The author wishes to express his thanks to the Directors of Associated Fumigators Ltd., for permission to publish the above results and to Messrs. W. J. Craven and Co. Ltd., and to Messrs. R. E. Longmate Ltd., for their co-operation in the field trials tabulated above.

*Sponsored Research Division, Dr. M.A. Phillips and Associates, Romford.

†Solids or piquids, provided that the latter do not contain any substantial amount of water.

**Chapman, Phillips and Associated Fumigators Ltd.

YUGOSLAVIAN EXPERIMENTS FOR THE PROTECTION OF SUGAR BEET

Preliminary observations by ING. R. VUKCEVIC

TOWARDS the end of this year an interesting work on the control of aphids and virus yellows on sugar beet will be published in Yugoslavia. As it might be of some interest to sugar beet growers and aerial applicators, Ing. R. Vukcevic gives here a brief summary, which will be followed up in a later issue.

It concerns a new, easier method of application for large scale spraying. This method is not convenient for small plots but only for large plantations (plots over 10 ha.; e.g. State properties or co-operative plots). In Yugoslavia, the number of large sugar beet plots increase from year to year. To quote an example: at " Belje," a large farm near Osijek, on the Hungarian frontier, there are sugar beet plots of up to 400 ha. in size (1 ha. is approximately equal to 2.15 acres). The possibility of applying, at low volume, the systemic insecticide " Metasystox " (for the control of aphids (*Aphis fabae*), by helicopter (Hiller) and fixed-wing (Stearman 450). was studied during 1958.

In preliminary comparative trials, it was shown that the result of low volume air spraying was as good as that done with ground sprayers at medium volume, 400 litres of mixture per hectare (as was recommended in the past). For helicopter or fixed-wing aircraft spraying, 38 litres per hectare were used. In both cases the amount of Metasystox was the same (800 gr./ha.). This new air spraying method was, after the first conclusive trial applied on a large scale, and last year at " Belje " nearly 700 ha. of sugar beet which were previously severely infested with Black Fly, were successfully treated either by helicopter or fixed wing aircraft.- The effect of Metasystox lasted a fortnight on treated plots, while untreated plots were severely infested. It must be mentioned here that *Aphis fabae* on sugar beet is only of economic importance in Yugoslavia because of weather and ecological conditions, and it is a more serious pest than in England. These successful, large-scale experiments, carried out last year, were the first of their kind in Europe.

In Yugoslavia it is thought that the protection of sugar beet by air spraying with systemics against aphids presents new possibilities for improvement of this crop.

We hope to see this spraying method accepted and improved in different countries, particularly those of Central Europe, where similar problems exist.

AN INTRODUCTION TO THE STUDY OF WOOD DECAY *

By **N. E. HICKIN,** *Director, Rentokil Ltd.*

IN the first half of the paper delivered to the Pest Control Conference of the British Ratin Group Mr. Hickin dealt with the importance of wood, its structure both chemically and physically and the classification of woody plants. He briefly illustrated the difference between hard and soft woods. These points leading on to the problem of wood decay.

DEFINITION OF WOOD DECAY

Dictionary definitions of the word decay all refer to deterioration, and although not specifically saying so, obviously refer to the comparison with the original properties of the material. The dictionaries also seem pre-occupied with the end-product of decay, and although the *process* of decay is ıeferred to, it is obvious from examples given that the degree of decay envisaged is considerably advanced. It is uncertain in the absence of a comprehensive review whether wood, one of the oldest substances known to man, is unique in this regard, but relatively small changes in one of many properties are generally looked upon as decay. A few flight holes of *Lyctus* appearing in a piece of sapwood incorporated into an oak table gives the owner an uncomfortable feeling that his furniture is decaying, although the process of decay due to the depredation of a wood-boring insect may only be in the primary stages.

Decay of wood, then, occurs when any deterioration in any property of the wood occurs. This may be in appearance only where the appeal is to the aesthetic sense which may be developed to a greater or lesser extent; on the other hand, the deterioration may be due to alteration in physical properties such as hardness, tensile strength, or load-carrying capacity.

THE FACTORS OF WOOD DECAY

The main groups of causative agents producing a deterioration in wood have been listed a number of times by various authors. The individual groups have been given greater or lesser emphasis according to the eventual purpose of the author. Modern research, however, suggests that several of the factors of decay previously thought quite distinct as decaying organisms are indeed dependant on each other.

A convenient main grouping is as follows:

1. *Attack by Wood-rotting Fungi.* Perhaps the most important factor of wood-decay. If the total world's cellulose crop is envisaged, it is seen that for conditions of equilibrium to exist, there must be an equal amount destroyed, and it is mainly through the medium of the wood-rotting fungi that this takes place.

2. *Attack by Wood-boring Animals.* Many different orders of animals utilise wood as a foodstuff, either directly or indirectly, although it appears that very few animal groups can digest cellulose unless in the presence of wood-destroying fungi or other plant forms. Fungal attack may already be in process before the animal arrives at the scene, or it may be brought with it—the Ambrosia Beetles *Platypodidae*, etc., being examples. Or the cellulose fragments may be torn off and passed into the gut of the animal, and there digestion takes place through the process of yeast-like cells which secrete the necessary enzymes for digestion of the cellulose. This is an example of symbiosis—an association of differing organisms to their mutual advantage.

Several wood-boring animals previously thought to have no connection with wood-destroying fungi are now known to derive important benefit from their presence in the superficial layer of wood, *e.g.*, *Teredo* and soft rots.

3. *Mechanical Wear or Breakdown.*

4. *Chemical Degradation or Decomposition of Wood.* Although wooden vessels are often used to contain corrosive fluids because steel and other metal would more readily be corroded, wood is decayed by many chemical substances.

5. *Decay by Heat.*

How Wood-rotting Fungi Decay Wood

The ability of fungi to decay wood is due entirely to their ability to break down cellulose into simple degradation products which can be utilised for respiration. This is brought about by the secretion of suitable enzymes and is known as enzymatic degradation. Enzymes are catalytic substances produced by living cells which can cause chemical changes to take place without suffering any change themselves. Enzymes are specific in their action, one particular enzyme producing one particular reaction. In this and other respects they differ from chemical catalysts, which they resemble in function. Enzymes are named by adding " ase " to the root of the

* *An abridged account of the paper delivered to the Pest Control Conference of British Ratin Group, May, 1959.*

substrate on which they act. The enzyme cellulase is the one responsible for the hydrolysis of cellulose, and acts both outside and inside the fungal cells. Outside the cell wall the cellulose is broken down to low molecular weight sugars by the secretion of enzyme by the actively growing hyphae on to the water film coating the wood fibre. The intermediate stage from cellulose to glucose is known as " cellobiose."

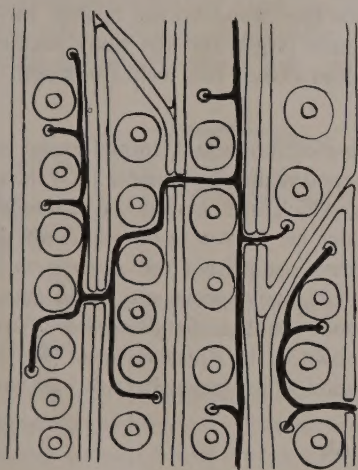


Figure 1—Softwood shown in longitudinal section highly magnified. The hyphae of a wood-rotting fungus are shown entering the tracheid-walls in section and in surface view. Diagrammatic.

The enzymatic effect on lignin has not been studied and all that is known is that the lignin acts as a barrier to enzymes normally acting on cellulose. In other words, without the presence of lignin, the cellulose would be degraded much more readily in the presence of the appropriate enzymes. The products pass through the cell wall to the inside, where final breakdown takes place (the related enzyme B Glucosidase is responsible for this).

The Wood-rotting Fungi

The origin of the extraordinary large group in the vegetable kingdom known as the Fungi is shrouded in mystery. Perhaps most authorities consider that they have been derived from alga-like plants, but that their parasitic or saprophytic mode of life has caused profound changes in their morphology and physiology. The common character of all fungi is the absence of chloroplasts—the small mobile bodies in the cells containing chlorophyll and concerned in the process of photosynthesis. Fungi are therefore unable to build up carbohydrate food material from carbon dioxide from the air and water, and must in consequence obtain this essential nutrient from other organic matter, animal or vegetable, living or dead. There is hardly a group of living organisms that is not associated with fungi either living on or in it as a parasite, when it is alive, or helping to split up or decay it, when it is dead.

The group of the Fungi most concerned in the decay of wood is the *Basidiomycetes*, with a few species in the *Ascomycetes*, but of recent years a great deal of attention has been given to a group of Fungi known as the " Fungi Imperfecti," which is concerned with the decay of wood known as " Soft-Rot."

One of the most important features of fungi is the nature of the cell wall. In almost all cases, this is not cellulose as in all other plants, but a substance very similar to Chitin—a substance of which a large part of the insect skeleton is composed. On reflection it is not surprising that an organism secreting a cellulose-digesting enzyme should not have cell walls of cellulose. In the evolution of the fungi, the change in the basic chemical substance of the cell wall must have preceded the cellulose-feeding habit. The thallus of the wood-rotting fungi is often not a gross feature of the wood decay it causes. It consists often only of threads one cell in thickness (the hyphae), which proliferate inside the wood, attacking the wood substance by boring holes in it just large enough for the hypha to pass through. See Fig. 1. Sometimes, however, the hyphae are present as a dense mat (mycelium) covering the surface of the wood, and invading as a sheet over intervening brick, stone or plaster. Other hyphae sometimes form aggregates or strands for conveying nutrient materials or water.

Distribution of the wood-rotting fungi is usually effected by spores. These are minute—a single spore not being visible to the naked eye—but they are produced in very large quantities. Being so light, they are blown about by the wind, and their presence can be demonstrated in almost every conceivable situation.

Little is known of the fungi responsible for " soft rot." A species, however, which has had some study in the United Kingdom is *Chaetomium globosum*. It appears to be present in almost all very wet situations, an example being the cooling towers of electricity generating stations.

Wood Destroying Animals

Many diverse groups of animals destroy wood. This is always done by burrowing within it either by the immature and adult stage, or by the immature stage alone. At each generation, means exist for distribution by the resulting adults leaving the infested wood (*Anobium punctatum*) or by young larvae being ejected from it (*Teredo*).

Crustacea

This animal class comprises crabs, lobsters, crayfish, prawns, shrimps, sandhoppers, woodlice, barnacles and water-fleas. The Crustacea (although differing widely among themselves) differ from insects with which (and

with some other groups) they form the Phylum *Arthropoda* by possessing two pairs of antennae and at least three pairs of jaw-like appendages behind the mouth. A number of Crustaceans are known as Wood-borers in floating or sunken wood in the sea, the most important being the Gribble (*Limnoria lignorum*). This is a member of the group *Isopoda* and resembles a small woodlouse about one eighth of an inch in length and dark grey in colour. It has seven pairs of walking legs. Where found it is usually present in very large numbers, and bores into the surface of the wood, the gallery in the first place running obliquely until it is about half an inch from the surface, then parallel to it. From time to time a " manhole " is constructed, giving direct access to the fresh seawater.

When the outer half an inch of timber has been completely honeycombed, it is washed away by wave action, and the tunnelling then starts in the next half-inch layer. Each gallery contains a pair of animals, but only the female does the burrowing, and she produces about twelve larvae at a time. The latter make burrowings sideways from the parental burrow, and when they obtain access to the sea, they swim off and find another timber to infest. Another Crustacean inhabits the *Limnoria* burrows named *Chelura terebrans*, belonging to the group *Amphipoda*. It is thought that this is an example of symbiosis—two animals living in close association with each other from which they derive mutual benefits.

No cellulose digesting enzymes are secreted by the *Limnoria*, so that cellulose itself is not being utilised by the animal as a foodstuff. The suggestion has been made, however, that *Limnoria* is actually feeding on soft-rot fungi, which would be present in the superficial layer of the wood.

Mollusca

This group contains among many other forms, snails, slugs, mussels, oysters and whelks, and anatomically contains many diverse elements. The group *Eulamellibranchiata* contains a number of animals with the wood-boring habit. The best-known is the ship-worm *Teredo*, a bivalve which, with related genera such as *Martesia*, is of great importance in many seas of the world as a destroyer of wooden-hulled ships, and of wooden harbour works. The free-swimming larvae are produced in large quantities, and actively swim about in search of wood. Those that are fortunate enough to find it, first attach themselves to it by a thread, then start to burrow into it after a metamorphosis. The gallery in the wood is always lined with a calcareous material which serves to make identification a simple operation.

The animal can attain a length of eighteen inches or so, and its burrow can be up to an inch in diameter. The only signs of external damage are the small openings in the wood made by the larvae when they first bored in. Two siphons about an inch and a half in length emerge from this hole, and they can be quickly retracted, whilst at the other end of the elongated body the two small shells rasp away the wood by their continual rocking motion. Cellulase is secreted by *Teredo* so that some digestion of cellulose takes place, but some planktonic organisms sucked in through the inhalant siphon are also used as nutrient material. Again, it is believed that soft-rot fungi play some part in the boring relationship of this animal, but precise detail is unknown. *Xylophaga dorsalis* is another wood-boring bivalve Mollusc. The shells are much larger and the body smaller, and the galleries seldom exceed two inches in length.

Insects

By far the most important animal group causing destruction of wood is the class Insecta. Of the twenty-nine orders into which the Insecta is divided, five have members which are known to bore into wood. None of the four orders comprising the *Apterygota* is a wood-borer, although many species are found amongst highly decayed wood. In the *Exopterygota* a wood-boring species is known in the *Ephemeroptera* (Mayflies). This is *Povilla adusta*, whose larvae burrow into wood floating

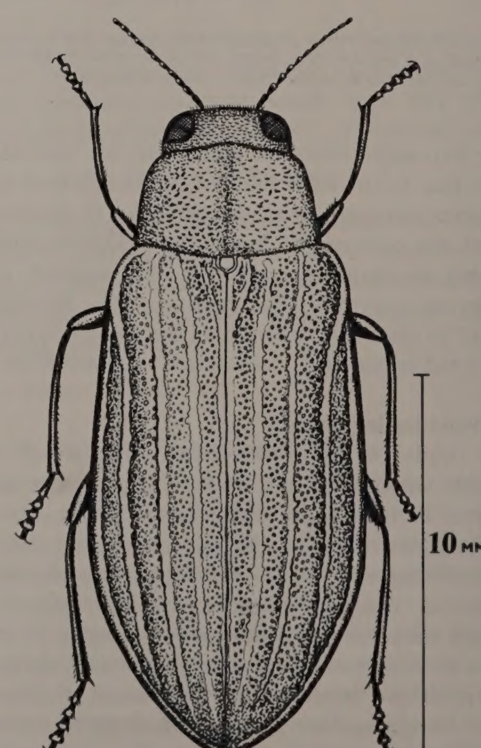


Figure 2—Buprestis aurulenta. The larva of this bright green shining beetle bores into Douglas Fir in Canada. The timber containing larvae, is often converted and imported into the British Isles. The beetles emerge many years afterwards—the decrease in moisture content of the timber prolonging the larval life.

or submerged in the fresh water of East and Central Africa. It is almost certain that aquatic wood-rotting fungi (probably species of soft-rot fungi) cause the initial infestation of the wood, enabling the *P. adusta* larvae to commence burrowing operations.

The *Hymenoptera* (Ants, Bees and Wasps) contain a primitive family, the *Siricidae*, known as Wood-wasps and Horn Tails. These are large insects, the female having a large strong oviposter, by means of which it drills a hole through the bark of a tree (the British species *Urocerus gigas* develops in various coniferous trees) and passes a single egg into the new wood. When the larva

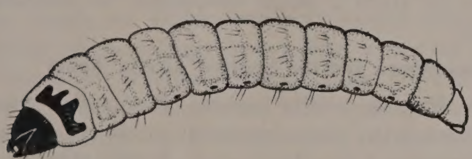


Figure 3—Larva of the Goat Moth Cossus cossus. It is found boring in the trunks of oak, ash and willow. It takes three or four years to complete growth.

hatches, it bores into the heartwood for about two years before completing the life cycle. The larva is characterised by a horny process borne on the terminal segment of the abdomen, and the larval galleries can be identified by being tightly packed with bore dust.

About 100,000 different species of *Lepidoptera* (Butterflies and Moths) have been described, but relatively very few members of this order have adopted the wood-boring habit. However, one rather primitive family, the *Cossidae* (Goat and Carpenter Moths) consisting of large or very large species, has wood-boring larvae. These infest fruit and other trees, making very large galleries.

Cossus cossus, the Goat Moth, is British, as is *Zeuzera pyrina*, the Leopard Moth.

The order *Isoptera* (Termites) is an extremely important wood-destroying group. These insects have a social organisation, and live in large communities consisting of several castes. In the termitarium often deep in the ground in a special cell live the royal pair. These are usually the original founders of the colony, now having lost their wings. The abdomen of the female swells to an immense size, and often up to 1,000 eggs per day are laid over relatively long periods (several or many years). In addition to the reproductive castes, there are the sterile castes—workers and soldiers. The former, as their name suggests, carry out the duties of foraging for food, chewing up wood on which to grow fungus, cleaning the nest, nursing duties, etc., whilst the soldiers defend the nest from invaders and maurading insects. There are over 1,700 different species known, and they are extremely common in the tropics and warm temperate countries,

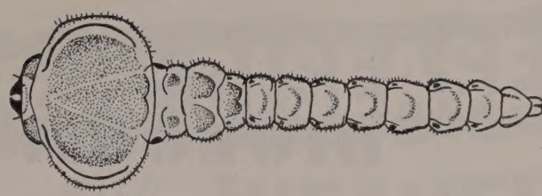


Figure 4—Larva of Chalcophora mariana. A member of the family Buprestidae. Larvae of this family usually feed in the phloem when young before entering the wood.

but only two species are commonly found in Europe, *Kalotermes flavicollis* and *Reticulitermes lucifungus*,but neither of these has been found in the British Isles. There have been many studies on the nutrition and method of feeding of termites. It has been discovered that the insects do not secrete cellulase, but the digestion of cellulose is carried out by intestinal protozoa—primitive one-celled animals inhabiting the gut. This is yet another case of symbiosis—animals of different species associating together to their mutual benefit. Each species of termite carries its characteristic species of flagellate protozoan, although some termites harbour as many as ten different protozoan species.

Perhaps the most highly developed of all insects are the *Coleoptera* (Beetles). They number about 220,000 different species, and are therefore the most numerous order in the animal kingdom. They outnumber in species all other insects. The biology of beetles is certainly most diverse, and no other insects have invaded land, water and air to anything like the same extent. Almost every form of organic matter is utilised as food by beetles, except living animals. It is not surprising, therefore, to find many families of beetles utilising wood as a foodstuff. Many thousands of species of beetle larvae bore into the wood of living trees, and, on the other hand, wood in the last stages of fungal decay is likewise attacked.

The most important families of beetles with wood-boring habits are as follows: *Buprestidae*, *Anobiidae*, *Bostrichidae*, *Lyctidae*, *Lymexylidae*, *Oedemeridae*, *Cerambycidae*, *Curcolionidae*, (including *Scolytinae* and *Platypodidae*).

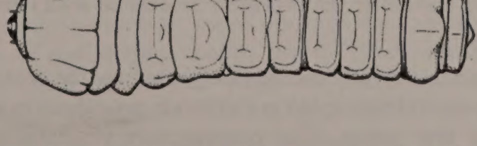


Figure 5—Larva of Hylotrupes bajalas, a member of the Cerambycidae. This family is perhaps the most successful of all beetle families in utilising wood as foodstuff.

BIOLOGICAL WARFARE

By A. K. PALMER, B.Sc., (*Pest Technology*)

PART I—Self Propagating Organisms

THE realization that the development of resistant arthropods threatens to outstrip the development of new pesticides has revived interest in biological methods of control. With the knowledge that insects are subject to attack from rickettsiae, fungi, viruses, bacteria, protozoa and nematodes, investigations have been carried out into the possible use of these organisms as agents for biological control. However the advances in recent years have mainly concerned the use of virus, bacterial and fungal infections, the effect of other micro-organisms remains, for the most part, untested. Notable pioneers in the field of microbial insect control include, Steinhaus, Hall, Briggs, Thompson and Tanada and research has been carried out mainly in the U.S.A., although outstanding work is being done in Canada and Europe as well as behind the Iron Curtain.

Dr. I. M. Hall, of the University of California, has divided the pathogenic organisms, used for the control of insects, into two main categories. The first category includes those organisms which are better suited to limited introductions or colonizations since they have effective methods of dispersal and development, permitting spread and survival despite fluctuations in the host population.

The second category includes those organisms that are suited for direct application on plants for the initiation of epizootics to bring about microbial control of a given pest population. The organisms in this category do not spread or survive on their own and have to be continually applied. Unlike the organisms in the first category which encounter the problems generally associated with biological control, the organisms in the second category usually encounter the problems associated with chemical control.

The entomophthoraceous fungi used for the control of the spotted alfalfa aphid in California provide an example of the first group. The commercially produced milky disease bacteria used for the control of the Japanese beetle is also included in this category although the soil has to be given a single inoculation to establish the disease.

Entomophthora and the Spotted Alfalfa Aphid

The spotted alfalfa aphid, *Therioaphis maculata* (Buckton) is the most important insect pest of alfalfa, ever introduced into California. Within three years of its first introduction into California (1954) it had spread through most of the state's alfalfa acreage and had caused a loss of 25 million dollars. Practically all known methods of control including, cultural, chemical, biological (e.g. predators such as the ladybird beetle, damsel flies and certain parasitic hymenoptera) and the use of resistant varieties of alfalfa in addition to various combinations of these methods, have been tried. Largely due to the efforts of Hall and Dunn of the Biological Control Department of the University of California, parasitic fungi have been established in certain areas of California as a valuable agent for the control of the spotted alfalfa aphid.

Of the five species of Entomophthoraceous fungi known to be parasites of the spotted alfalfa aphid in California, *E. exitialis* Hall and Dunn (1957) (Hilgardia, **27**, 4) and *E. virulenta* Hall and Dunn (1957) are highly pathogenic to the aphid. Although it has been possible to disseminate *E. extialis* throughout California, *E. virulenta* has resisted practically all efforts to establish it in Northern and Central California, despite the fact that it is widespread in Southern California. Under favourable conditions these two species are capable of bringing about marked reductions in aphid populations.

Distribution

Temperature and humidity (influenced by wind) can seriously affect the distribution of the fungi and their effectiveness against the aphid. Although the overall effect of temperature on the various species of fungi is not clear, there are indications that the organisms differ somewhat in their response to temperature and the range favourable for development is not the same for each species. None of the fungi can survive sustained temperatures of 100°F. whilst most remain alive but do not grow at sustained temperatures of 37°F.

Natural distribution of the fungi is generally accomplished by the dispersal (migration) of infected winged aphids, but once the fungi are present in a field they are transmitted to aphids of every growth stage by means of wind-borne spores (conidia) which are forcibly discharged from aerial parts of the fungi on a dead host. Resting spores which are formed by the fungi especially during the autumn and winter months, are thought to be an aid to the survival of the organisms during periods when the host insects are absent or at very low densities.

Various means of artificial dissemination of the fungi have been tried (Hall and Dunn, 1958, Journ. Econ. Ent., **51**, 3, 341-344) but by far the most efficient method is to transfer freshly cut alfalfa with both fungus killed and live aphids on the foliage, from a field where the fuhgi are active to one where a moderate aphid population is present and where no disease has been noticed. However, this method of transfer is restricted and regulated by the agricultural commissioners of the counties concerned.

Results of Control Programmes

It must be mentioned that quantitative evaluation of the results of artificial dissemination are difficult due to the natural spread of the disease by winged aphids. Surveys, for the most part, have been irregular and it has been possible for only a few workers to gain enough experience to identify the different fungi. The effect of the fungi may also be masked by the activities of other predators, however, there can be no doubt that fungus diseases can make an important contribution to the aphid control programme. To quote one example from a report by the Agricultural Extension Serviee of the University of California:

> " An outstanding example of biological control of spotted alfalfa aphid with pathogenic fungi occurs in 240 acres of alfalfa on the Colarado River Flood Plain at Bard, California. These fields have been subjected to heavy aphid attack since they were planted, but the build up of pathogenic fungi and ladybird beetles has been such that no insecticidal treatments have been required since April 1955. The grower has recognised the importance of control by disease and has made changes in his irrigation practices to cieate more humid conditions in the fields for better growth of the fungi. Because of excellent drainage he has been able to irrigate his fields more frequently than normal without damaging the alfalfa. Thus in the late spring months the blanket of humidity maintained by the extra irrigation, allowed the fungi to continue to attack the aphid populations, despite the effect of the almost continuous winds, which hindered the fungi elsewhere in the low desert area. Since the aphid build up in April, the fields have been infested with only light populations of aphids."

Comments

From the preceeding information it will be appreciated that the extent to which the organisms in this category can be used for the control of pests is restricted to the extent to which the problems generally associated with biological control, can be overcome. These problems have been discussed by various authors (e.g. Varley, April 1959, Fernhurst Lecture to the Royal Society of Arts) and it will be sufficient to mention one or two of these problems.

The host density which initiates an epidemic of the fungi, has not been determined but the aphid population, particularly after a period of dormancy such as winter, can rise to a high level and perhaps cause some damage to crops before the fungi becomes effective. However, after such an outbreak, succeeding aphid populations are often of low density, unless dry or windy conditions, which have an adverse effect on the fungi, prevail. Although, in this case, the damage, caused by the initial outbreaks of aphid and the subsequent low density populations, may not be of economic importance, on a crop, such as fruit for export, where quality is of prime

importance, damage to the same extent may not be tolerated. It can be seen that the temperature and humidity range for the effective development of the fungi may not coincide exactly with that of the aphid so that certain climatic conditions may be too dry for the effective spread and development of the fungi and yet will permit the build up of a large aphid population. This problem can be overcome to a certain degree by irrigation.

It has often been said that one advantage of biological control is that as the host develops resistant strains so the parasite or predator develops more efficient strains and in effect evolution remains neutral. However this does not always hold true, especially with highly pathogenic organisms, for the trend of evolution in parasitism is often towards parasites which have little effect on the host or at the most produces a chronic condition and not death. This effect is to the advantage of the parasite in that it will have a better chance of transmission to a new host.

Regarding microbial control it may well be worth while to consider the facts arising from the use of myxomatosis virus for the control of rabbits. The problems that have emerged in this case have been concisely and efficiently expressed at the International Conference on Harmful Mammals and Their Control, held in London in October 1939 and the report published by EPPO in February 1959

Myxomatosis was first found in Britain in 1953, and by the end of 1955 it had spread throughout the country, exterminating 90% or more of the wild rabbit population in the process. The distribution in Britain was due to a combination of local natural spread by the rabbit flea (*Spilopsyllus cuniculi*) and the transport of infected rabbits from place to place. However as early as 1955 attenuated strains were found and they are on the increase. The rabbits frequently recover from an attack by an attenuated strain of the virus and, what is more important, is the fact that the rabbit gains an acquired immunity to the virulent strain. To quote Thompson, from the EPPO report: "The more frequent occurrence of a typical strains in Britain must eventually result in a lower mortality throughout the country and, although there is no evidence here of genetic resistance to myxomatosis, it remains a possibility." Rabbits are reported to be on the increase.

In Australia the disease was transmitted by mosquitoes and the spectacular epizootics of 1950-51, 1951-52, and subsequent years, were due to a series of wet years with a consequent high production of mosquito vectors. Despite the very high mortalities of rabbits in Australia since 1950-51, widespread attentuation of the virus, coupled with the development of marked resistance to the disease amongst some rabbit populations and, especially, unfavourable conditions for the spread of the disease in a number of places each year, have resulted in rabbit numbers in Australia still being appreciable and causing appreciable damage to crops and pasture.

So far there is no evidence of the development of attenuated strains of *E. virulenta* or *E. exitalis* nor have the aphids shown any appreciable resistance to them but the experiences with myxomatosis should be remembered when organisms of the first category are used for the control of pests. (*to be continued*)

Correction—

July/August, 1959, page 255, column 1, paragraph immediately below table, line 5, substitute:-

"The manufacturers state that the tubes can be stored for 2 years at temperatures not higher than 30°C., and that the actual test can be carried out at temperatures between 0° and 40°C. The tubes are not entirely. . .etc."

TIMBER !

The following articles conclude the Abstracts from The British Wood Preserving Association's Annual Convention, 1959

THE INFLUENCE OF SOFT ROT ON THE SUSCEPTIBILITY OF BEECH TO ATTACK BY THE COMMON FURNITURE BEETLE

(*Anobium punctatum Deg.*)

By J. D. BLETCHLY, B.A., B.Sc., F.R.E.S.
(*Officer-in-Charge, Entomology Section, Forest Products Research Laboratory*).

Introduction

THE COMMON FURNITURE BEETLE occurs in many countries with temperate climates. In the United Kingdom it is the most widespread of the insect pests of timber used for structural purposes, joinery, furniture or certain types of plywood. It attacks both hardwoods and softwoods, including comparatively freshly seasoned material, although the damage does not normally become obvious until the wood has been in service for several years. From a structural point of view the damage is of minor importance compared with that caused by the Death-Watch or House-Longhorn beetles, yet if we compare all types of woodwork, the total economic loss sustained in Great Britain through infestation of the Common Furniture beetle must be far greater.

Studies on the biology and habits of *Anobium* at Princes Risborough were first directed towards the possibility of fascilating laboratory investigations by shortening the period of the life cycle, the length of which presents many difficulties to the research worker. It was thought that it might be possible to reduce this period by the use of timber decayed by certain types of wood rotting fungi; a hypothesis based on two factors.

1. It had been shown by Fisher (1941) that the use of decayed wood shortened the length of the life cycle of the closely related death-watch beetle *Xestobium rufovillosum*.
2. It is a matter of common observation that *Anobium* attack often appears to be most severe in damp and decayed wood. Following fungal decay, heartwood (often immune) may be preferred to the sounder sapwood, which would normally form the more suitable diet (Bletchly, 1953).

Investigations were therefore initiated on the effect of wood destroying brown and white rots (Basidiomycetes) on the rate of growth of *Anobium* larvae; these were shown to gain weight faster in decayed wood than in the sound controls under incubator conditions. However, since *Anobium* attack will proceed successfuliy in the absence of white or brown rots and at a humidity level where there is no possibility of the existence of wood-destroying micro-fungi (soft rots), it is apparent that this insect can attack sound wood. Nevertheless indications were noted in the course of advisory work that the presence of soft rot permitted the extension of *Anobium* attack into heartwood (Savory, 1955). For this reason, and in view of their widespread occurence, it was felt these studies on the relationship between the presence of fungal decay and *Anobium* attack should be extended to include the soft rots. The present paper gives a progress report on this work which is being continued.

The Soft Rots

The soft rots attack the polysaccharides of the cell wall and, in the latter stages, some of the lignin may be decomposed. A number of species of soft rots are known and a variety of timber species are subject to attack; hardwoods seem to be very susceptible but softwoods are also attacked.

Material

Beech (*Fagus sylvatica*) was employed in these investigations since of the hardwoods it was known to be one of the species most susceptible to attack both by *Anobium*

and soft rot. Blocks 10 by 6 by ½ cm. were cut from 6 in. thick discs from the upper end of a bolt of a specially felled beech tree. It was known that in several timber species the sapwood for *Anobium* attack often varies according to the position from which the sample is cut, the outermost zones usually being the most suitable. The beech discs were therefore marked out in zones labelled A (outer), B (middle), and C (inner).

Results

The results were assessed on the basis of comparing the average larval weights attained in matched sound and decayed samples cut from the three zones of beech studied. The results were examined statistically.

Comparison of the ratios of the number of live larvae recovered to the number of eggs laid indicates that the presence of soft rot favours the successful establishment of larvae. The proportion of living larvae found is greater in blocks decayed to higher losses in weight than in those with lower weight losses or in the sound controls. Some of these data have been examined statistically but do not give strong support to such a view.

Discussion

It appears that there was a significant reduction in the suitability of the sound beech material for the nutrition of *Anobium* larvae in the innermost zone compared with the outer and the middle zones. It is thought that these differences between zones may be due to variations in nitrogen content (Bletchly and Farmer, 1959) and the data give some support to this view.

The primary object of this investigation was the study of the effect of soft rot on the suitability of beech for the nutrition of *Anobium* larvae. Results show that the presence of soft rot increased the suitability in all cases and, with two exceptions, the effect was highly significant. The two exceptions, which were either probably significant or significant, occurred in the lowest range of loss in weight which is due to decay of the samples.

The possibility that larvae might establish themselves more easily where decay is greater is of great importance. If this is so it would, together with the higher rate of gain in larval weight which has been shown to occur in such material, result in the establishment of a larger and more successful larval population in wood infected with soft rot, compared with sound material, assuming that the beetles exhibit no preference for egg-laying between sound and decayed material.

It is likely that soft rot would provide a suitable surface for egg-laying as was noted in the case of wood-destroying fungi (Bletchly, 1953).

Comparison between the effects of soft rot with white or brown rots, shows resemblance in the increased rate of larval growth in decayed material and in a possibly greater ease of initial larval penetration. There are

indications of a higher larval survival rate in material decayed by soft rot than by white or brown rot; however it is considered that the data on the white and brown rots were not conclusive.

The data obtained by Fisher (1940) in studying the death-watch beetle are comparable. Fisher found that the first stage larvae have difficulty in boring into sound or slightly decayed wood and that when they do so their mortality is high. On the other hand, where decay was more severe, the extent of tunnelling by the larvae was increased and the rate of larval development was more rapid. In making these comparisons it must, however, be remembered that whereas the common furniture beetle can develop successfully in sound wood, the death-watch beetle can only do so with difficulty and then only after a prolonged life cycle. It therefore follows that the death-watch beetle is much more dependant on the presence of fungal decay than *Anobium* and studies on the effect of soft rot on the suitability of wood for *Xestobium* attack would be of considerable comparative interest.

FURTHER STUDIES ON THE COMPOSITION OF WOOD PRESERVING CREOSOTE

By D. McNEIL, B.Sc., Ph.D., F.R.I.C.
(*Director of Research, The Coal Tar Research Association*).

SUMMARY

There has recently been developed, mainly as a result of research in Great Britain, a new and powerful method for the qualitative and quantitative analysis of complex mixtures of chemically similar compounds. A description of the principles of this new method of Gas Liquid Chromatography (G.L.C.) and the apparatus and techniques used is given and its limitations are discussed in this paper. The main limitation is its restriction at present to the study of mixtures boiling below 300°C. and it can therefore, at this stage in its development, only be applied to the study of the individual components in the lower boiling fractions of creosote.

Nevertheless the results obtained, as exemplified by its application to five creosote samples as described in this paper, are of value since they give additional evidence for the ideas on the chemical nature of creosote put forward in an earlier paper. Thus the results are in accord with:—

(a) the view that about 90% of the components in coke oven creosotes consists of polynuclear aromatic hydrocarbons of which the major members contain no substituent groups;

(b) the expectation that the phenolic compounds in continuous vertical retort creosotes are mainly high-boiling, water insoluble phenols; and

(c) the view that these two types of creosote contain essentially the same components although in very different distribution.

SOME FOREST PESTS

By E. H. B. BOULTON, M.C., M.A., F.I.W. Sc.,
(*Managing Director, Pestcure Ltd.*).

IN a speech well illustrated with slides Mr. E. H. B. Boulton stated that, second to fire, insects and fungi caused the greatest damage to forests. The most important forest pests are Coleoptera (Beetles), Lepidoptera (Butterflies and Moths), and Hymenoptera (Sawflies and Wood wasps). Forest pests can be arranged into groups i.e. leaf eaters, root eaters, shoot and bud borers, bark and phloem borers and wood borers.

Leaf Eaters

The Poplar Leaf Beetle (*Melasoma populi*) causes severe damage to young poplars in both adult and larval stages. A considerable amount of damage is done to broad leafed trees by the caterpillars or " loopers " of the Geometridae—important species being *Cheimatobia brumata* and *Hybernia defoliaria*.

The Oak Leaf Roller Moth (*Tortrix viridana*) and the Larch Leaf Minor Moth (*Coleophora laricella*) can cause extensive damage.

Amongst the Sawflies *Lophyrus pini* attacks pine leaves and *Nematus erichsoni* does considerable damage to young larch plantations.

Root Borers and Root Eaters

This group mainly affects young nursery plantations and the common cockchafer *Melolontha melolontha* (*vulgaris*) is the prime culprit. Some damage can also be caused by wire worms (*Elateridae*).

Shoot and Bud Borers and Eaters

The Pine Weevil (*Hylobius albietis*) is one of the most important forest pests in Europe. The damage to the trees being done by weevils climbing to the leading shoots and stripping the bark down to the cambium, and, if the trees are girdled they die.

The Pine Bark Beetle (*Myelophilus piniperda*) causes serious damage in young plantations by boring into the young growth just below the terminal bud, hollowing out the pith and soft tissues, thus killing the leader and spoiling straight growth. All efforts should be made to remove unhealthy trees as the Pine Bark Beetle is generally associated with them.

The caterpillars of the Pine Shoot Moth (*Tortrix buoliana*) and the Ash Bud Moth (*Prays curtisella*) also hollow out the terminal bud and prevent straight growth.

Bark and Phloem Borers

There are some 60-70 species of Scolytidae included in this group and of these *Scolytus destructor* has led to the death of large numbers of Elms both directly by feeding on the shoots of elms and girdling the trees but to a greater extent indirectly, by transmitting the spores of Dutch Elm disease.

Wood Borers

This group includes the Goat Moth (*Coccus ligniperda*) and the Wood Leopard Moth (*Zeuzera coesculi*) and the Longhorn Beetles (Cerambycidae) of which

there are some 20,000 species. The numbers of Long horns found in Europe are small, but they are very serious pests of Tropical forests. they are pests of woodlands and timber yards, some boring into standing trees whilst others are dead wood feeders. A number of species attacks any kind of wood.

The Wood Wasps (Sircidae) also come under this grouping.

Mr. Boulton concluded his speech by listing some of the control methods which included hand picking, the injection of carbon bi-sulphide into borings of large wood borers, spraying and grease banding.

THE AMERICAN WOOD PRESERVERS' ASSOCIATION AND SOME RECENT DEVELOPMENTS IN THE WOOD PRESERVING INDUSTRY

By J. M. GURD, (*Vice-President, Timber Preservers Ltd., British Columbia*).

Mr. Gurd gave an account of the structure of the American Wood-Preservers' Association (A.W.P.A.) and indicated some of the important contributions they had made to the timber industry. From this account he came to the following conclusions.

"1. Extensive Committee studies by volunteer personnel, representing users, manufacturers, chemists, engineers and others, result in adequate Specifications and are the best means of obtaining highest quality work, and providing the best products for the consumer. All such studies should be of a continuing nature, including service records. It must be emphasised that all results achieved by the A.W.P.A. are the result of voluntary co-operative effort, and that this is probably the best system.

2. There have been very few noticeable changes in treating procedures during the past twenty-five years. It is believed that whereas there have been some improvements in preservatives and processes, there is still much room for bettering. The improved treatment of Mountain-fir is such a worthwhile project. The assay method of determining retention shows great promise."

Mr. Gurd also came to the conclusion that, in America, too little money is spent by the trade on research, there is insufficient instruction in schools and in the professions of Engineering and Architecture, concerning lumber and the preserving of it; advertising media should be expanded; new horizons can be found by investigating the modern methods of construction including the glue-laminated members.

AN INTERPRETATION OF THE TRENDS IN THE PRODUCING OF TREATED WOOD AND IN THE USE OF WOOD PRESERVATIVES IN THE UNITED STATES, 1953-1958.

By REGINALD H. COLLEY (*Technical Director, Bernuth, Lembcke Co. Inc., New York, U.S.A.*).

Mr. Colley, illustrated the changes that have taken place in the 1953-1958 period with five tables in the form of comparative quantities of material treated and in relative percentages for the respective years.

Letter to the Editor

Dear Sir,

As always, the latest issue of "Pest Technology" has been read with great interest and I would like to say how much the rather more technical bias to be noted in the July/August issue is appreciated.

There is one point raised in your editorial account of the annual Convention of the British Wood Preserving Association which was held at Cambridge in July on which I would like to comment.

You draw attention to a suggestion made at the Conference that there should be an increasing use of fungicides blended with insecticides for the purpose of wood preservation. The reasons for this suggestion are very sound: timber is frequently exposed to attack and damage both by fungi and insects and, furthermore, insects and fungi are often closely associated in their work of destroying wood.

It is implied, however, by this suggestion that products combining insecticidal and fungicidal powers would be new, whereas in fact a number of first-class products formulated in this way are available. For example, we ourselves produce formulations combining insecticidal and fungicidal properties for protection of logs and lumber from attack by ambrosia beetles, powder post beetles and blue stain fungi during the production stages of timber and also manufacture wood preservatives which protect timber in use from destruction by fungi causing dry rot, wet rot, etc., and from insect pests such as woodworm, house longhorn beetle and termites.

Yours faithfully,

The Standardised Disinfectants Co. Ltd.,

D. Boocock,

Technical Director.

PEOPLE AND PLACES

German Scientist Honoured in Britain

The honorary degree of Doctor of Science was conferred by the Earl of Scarborough, as Chancellor of Durham University, at Congregation in Newcastle on Saturday, 4th July, 1959, on Hans Herman Kuehne, Dr. phil., Dr.h.c.

Dr. Kuehne, born in Magdeburg on 3rd June, 1880, entered in 1916 the service of Farbenfabriken Bayer, A.G., then called Leverkusen Farbenwerk—formerly Friedrich Bayer and Company. Only four years later Dr. Kuehne was appointed Director of Bayerwerk Leverkusen. After holding various other senior posts with the firm, he became managing director of Bayerwerk Leverkusen in 1933, and at the same time, a member of the Executive Committee of Directors of I.G. Farben. He was in charge of the Farbenfabriken Bayer Division of I.G. until 1943.

Dr. Kuehne's work as a chemist covers many creative achievements of great value. The first sulphuric acid plant using calcium sulphate as raw material was developed by him in Leverkusen. Between the two world wars, plants were erected at Billingham (England), Miramas (France) and Wolfen (now Eastern Zone of Germany). Since then large plants have been erected in Widnes and Whitehaven (England) and Linz (Austria), and there are also new plants operating in Eastern Germany and in Poland.

Dr. Kuehne acted as consultant in the construction of the anhydrite/sulphuric acid plant for Marchon Products Limited at Whitehaven, Cumberland.

His process provides a means of producing sulphuric acid in the United Kingdom at an economic price, using the country's anhydrite (calcium sulphate) deposits which are unlimited.

Dr. Kuehne has also achieved many successes in other fields where he has introduced a number of new processes. In addition to being well known as an industrial chemist, Dr. Kuehne is also an Honorary Senator and an Honorary Doctor of the University of Cologne.

Adviser on Liquid Seed Treating

Mr. J. D. Muirhead has been appointed to the Agricultural Technical Department of Shell Chemical Company. Mr. Muirhead will be available to advise merchants throughout the country on problems concerned with the installation, maintenance and calibration of the special seed treater required for the application of "Panogen" and "Astex" which have been introduced recently on to the U.K. market by Shell Chemical Company.

Mr. Muirhead was educated at Rugby School and subsequently served in the teaching branch of the Royal Navy. After studying Arts at University College, London, and Experimental Science at Trinity College, Dublin, he managed his father's farm near Godalming from 1951 to 1959. At the same time he became a partner in an agricultural contracting business specialising in crop spraying, which operated in Sussex, East Hampshire and Surrey.

New Director for Canadian Subsidiary

Brigadier Wilfred Mavor, C.B.E., M.C., E.D., has been appointed to the Board of Electric Reduction Company of Canada, Ltd., one of

Sir Thomas Dalling, LL.D., F.R.C.V.S., F.R.S.E., (right) is seen here being greeted by Dr. William M. McKay, M.R.C.V.S., when he recently visited Cyanamid of Great Britain Limited (Bush House, Aldwych, London).
Sir Thomas is a veterinary consultant with the United Nations Food and Agriculture Organisation, Rome. Dr. McKay was appointed earlier this year as agricultural scientific co-ordinator for the European region of Cyanamid International

the Albright & Wilson Group of Companies, and producers of phosphorus, phosphates and chlorates. The appointment was announced simultaneously on 29th July in London and Toronto.

Electric Reduction Company of Canada, Ltd., (ERCO) is currently engaged on a large project to expand and diversify its production facilities and is building at Port Maitland, Ontario, new plants to produce phosphoric acid, sodium tripolyphosphate and dicalcium phosphate for stock feed. ERCO have also recently acquired a modern fertilizer plant from Dominion Fertilizers Ltd., at Port Maitland where single and triple superphosphate will be made.

New Advisory Centre

On Tuesday, 8th July, the British Ratin Group opened another free Advisory Centre at 50 Queen Street, Edinburgh. The official opening ceremony was conducted by Mr. George L. Orchard, O.B.E., F.R.I.C.S., Lord Dean of Guild, City of Edinburgh.

This picture shows Mr. George L. Orchard (left) and Mr. George Stewart, Regional Manager of Woodworm & Dry Rot Control Ltd., examining a piece of woodworm-infested timber from Westminster Hall.

Photograph by courtesy of Edinburgh Evening Dispatch.

Imperial Chemical Industries

The Board of the Imperial Chemical Industries announce that certain changes have been made in the duties of Executive Directors; these include

The appointment of Mr. R. A. Banks as Director of Group C (Ammonia and Agriculture) in place of Mr. W. D. Scott, who becomes the Commercial Director in place of Sir Walter Warboys.

Sir Walter, who is 59, will retire from the Board on 31st October, 1959; he has served the Company for 34 years, during 11 of which he has been a Director of the Company.

The Company also announce that the Heavy Organic Chemicals Division has been transferred from Group C to Group F (to be known in the future as the Fibres and Heavy Organic Chemicals Group).

European Appointment for British Scientist.

Cyanamid International announce that Dr. Robert F. Hudson, Ph.D., B.Sc., A.R.C.S., D.I.C.—at present a lecturer in chemistry at Queen Mary College, University of London since 1947—has been appointed a group director at Cyanamid's Research Institute, Geneva. He will take up his appointment early in 1960.

Dr. Volker Franzen of the Max Plank Institute for Medical Research, Heidelberg, has also been appointed to a similar post.

Announcing the appointments, Dr. R. C. Swain, President of the Institute and Vice-President for Research and Process Development of the parent corporation, American Cyanamid Company, said that both scientists would pursue their investigations with a free hand, directing their work towards the uncovering of new scientific information rather than towards the development of specific commercial products.

Both scientists will work at the new basic research laboratory. Dr. Hudson will study the mechanism of organic substitution reactions and other theoretical and physical chemical problems, and, like Dr. Franzen, will be assisted by several post doctoral scientists chosen for their knowledge in the field he selects for investigation.

Dr. Franzen will include in his initial programme, research on high energy organic intermediates and on enzyme synthesis.

Earlier this year, Cyanamid European Research Institute acquired land for the laboratory in the Cologny section of Geneva, including a large residence that is now being converted to provide eventual facilities for 60 scientific and administrative personnel.

Dr. Robert F. Hudson, who has been appointed as a group director of one of the first research units at the Cyanamid European Research Institute in Geneva.

NEWS *and* NEW PRODUCTS

New Insecticidal Paints, I. " Lakil."

" Lakil " Insecticidal Paint was first marketed by a company which, due to land development requirements, is not now in existence.

It was felt that such a beneficial and, in fact, revolutionary product should not be allowed to die, therefore it was taken in hand by research workers of J. Manger & Son Ltd., an Amasal Company.

Before any Manger product is put on the market it is thoroughly tested under all sorts of conditions and no claim is made for it unless that claim can be fully substantiated. " Lakil " had to be measured against this standard.

Among the improvements made was to remove the obnoxious smell and to impart a gloss to what had previously been a flat finish. Now, " Lakil " clear varnish can be applied over existing decoration, or pigmented " Lakil " used for repainting, with an insecticidal ability effective for at least two years. In certain conditions the insecticidal life is much longer than this, but as the life does vary according to circumstances, we have given the minimum time that it will be effective under all circumstances.

" Lakil " is equally effective in temperate, tropical and arctic conditions. The briefest contact is sufficient for the insect to absorb the insecticide, which is not an instant killer, giving time for the insect to make for the outside air. " Lakil " is therefore perfect for use in hospitals, bakeries, canteens, breweries, farms, dairies, ships, kitchens, and every type of food store or any situation that is liable to be affected by insect pests of any type. In addition, in many buildings and in the home the use of " Lakil " is an effective treatment against woodworm and moths.

Price Lists can be obtained from J. Manger & Son Ltd., Kingsland, London, E.8.

New Insecticidal Paints, II. "I-Gene."

A new range of paints containing powerful insecticides which gives protection against insect pests has just appeared on the market.

Made by the Leyland Paint & Varnish Co. Ltd. of Leyland, Lancs., these coatings, marketed under the name " I-Gene " are said to be the first of their type to become available in this country.

The coatings may be used in temperate, semi-tropical and tropical climates and can be applied by brush, roller or spray in the same way as normal paints.

The insecticides which are incorporated into " I-Gene " coatings are Shell Chemical Company's "Aldrin" and " Dieldrin," two of the most powerful and persistent known. The insecticides are retained in the coating indefinitely and are released on to the surface of the coating as a " bloom " of crystalline insecticide. This " bloom " can be temporarily removed or disturbed by severe cleaning but renews itself on the paint surface within a few hours. An insect, on making contact with this " bloom " is quickly paralysed and killed.

The new paints are designed to kill most types of insects such as house-flies, blue-bottles, ants, earwigs, silver-fish, clothes moths, beetles, cockroaches and weevils. The clear lacquer in the range may be used on plain woodwork to give protection against woodworm or termites.

Surfaces painted with the new coatings are effective for a minimum of two years, even in severe conditions. It is anticipated that the coatings will find ready acceptance in such outlets as domestic and industrial kitchens, public buildings, canteens, hotels, farm buildings (cattle sheds, poultry houses etc.) furniture, hospitals, ships' galleys and other applications.

Other advantages are that the paints are non-poisonous to human beings and can be used with safety in pantries; nor do they have any harmful effect on animals. Painted surfaces can be repeatedly washed down without losing any of their insecticidal properties.

So-Dead Fly Bait

Control of flies carrying filth and disease remains an agricultural, domestic, industrial and public health problem of considerable magnitude. The use of knock-down space sprays and of residual sprays applied to walls and other surfaces has not been entirely successful in controlling flies and the development of resistance to DDT and other insecticides of this family has been an added problem.

A new approach to fly control has been required for some time and the development of dry fly baits now provides an effective new weapon for controlling these unpleasant and dangerous pests.

The Standardised Disinfectants Company Limited is now manufacturing a product of this type called So-Dead Fly Bait which incorporates a highly active insecticide of very low toxicity to animals and man.

So-Dead Fly Bait is very easy to use and it is simply scattered or placed where flies are seen to congregate. It can be broadcast by hand or can be placed in saucers or trays in strategic places. The bait can be renewed periodically as indicated by observation.

Like all other methods of chemical fly control, So-Dead Fly Bait must of course be used in conjunction with measures of good hygiene and sanitation.

So-Dead Fly Bait is coloured blue to avoid it being confused with food or feeding stuffs, blue being a colour never associated with food. Nevertheless, the material should naturally be kept away from children and domestic animals.

As So-Dead Fly Bait contains insect attractants it can also be expected to kill cockroaches, ants and some other domestic pests.

Although So-Dead Fly Bait is a newly developed product, it is in full production both for use in the United Kingdom and countries overseas. A brief descriptive leaflet about this product is freely available to those interested and is printed in four languages; English, French, Spanish and Portuguese.

Dow announces new Insect Control Spray.

Dow Chemical International Ltd. S.A. has announced plans to market a new insect and parasite control chemical. The new material is known as Korlan 44E and combines good residual propreties with very low toxicity to warm-blooded animals.

The insecticide is recommended for control of such insects as flies, cockroaches, lice and other parasites of cattle. It can be used in homes, restaurants, grocery stores, animal shelters, general farm buildings and in refuse areas where flies and insects breed and congregate.

In dairy barns, Korlan 44E can be sprayed on the walls and ceilings. The structures need not be closed tightly following the application and animals may be safely turned into the buildings as soon as the spray has dried. The spray should not be applied to milking or feeding equipment in milk processing rooms.

For control of roaches, a 1% solution applied to wooden panels, base boards and around pipes brings effective results.

The low toxicity of Korlan 44E makes it especially useful in the field of animal parasite control. Diluted and applied externally to animals, the insecticide will kill lice, screw-worms and other parasites and prevent a reinfestation of the animals for three weeks or longer after treatment.

The new material, Korlan 44E, is a four-pound per gallon emulsifiable formulation containing the active ingredient, Ronnel. (Dow ET 57 chemical name 0, 0-dimethyl 0-(2, 4, 5-trichlorophenyl) phosphorothioate)

The low toxicity of Korlan 44E to warm-blooded animals makes it suitable for use in many locations where the use of other insecticides is not permitted. Korlan does not have a residual odour. The odour at time of application dissipates rapidly as the spray dries.

Pig Spray.

H. E. Helman & Co. (Insecticides) Ltd., 10-22 Bank Street, Gravesend, Kent, announce that they have now finalised their tests and commenced to market, under the trade name "Ly-Cene," a pig spray which will kill pig lice, destroy their eggs and remove scale. This product has no taint and is effective for approximately 5/6 weeks. It can be applied simply with a flit spray or any recognised hand spray pump.

It will be found, after application that animals are quieter and more peaceful thus giving them a greater sense of well-being conducive to good health.

Prices are as follows:—

Pint	*Quart*	*½ Gall.*	*Gall.*
15-20 Pigs	35-40 Pigs	75-80 Pigs	150-160 Pigs
17/6	30/-	48/6	80/-

Previous to the introduction of the above product H. E. Helman & Co. (Insecticides) Ltd. recently introduced another two animal sprays. They were:—

1. "*Firm-Foot*" which is the first chemical formulation in which both a preventative and a curative for foot rot can be applied by spraying. Up to date, it has been necessary to pare the feet before applying a curative preparation. Messrs. Helman state that except in the most severe cases, is such practise necessary with "Firm-Foot." The persistency of this chemical formulation as a preventative will last between 6/8 weeks. As a preventative, it is only necessary to spray the feet thoroughly round both sides of the claw. As a curative, the same process is necessary, each claw should be opened as wide as possible and liberally sprayed direct to the centre.

"Firm-Foot" will destroy malignant tissues and accelerate new healthy growth. The distasteful smell of stock suffering from foot rot disappearing rapidly.

2. "*Hel-Mag*" which is a powerful fly repellent with a persistency of 8/12 weeks, this will vary according to wool density. "Hel-Mag" can be applied prior to crutching. Crutching is, however, necessary in severe cases, again depending upon wool density but in most instances it will be found that maggots will leave the animal's flesh and die instantly. During Crutching operations, it is only necessary to apply a short burst of the spray on the attacked area, the maggots being destroyed instantly and the repellent will guard the animal against further attack. The existence of maggot attack in any other part of the body due to cuts, abrasions and other damage can be treated by "Hel-Mag" in the same way. "Hel-Mag" will not cause any discoloration to the wool and will not taint the flesh.

Insecticidal Aerosols to Increase

A report issued by the Aerosol Packaging Co. Ltd., suggests that there will be an increased use, in Britain, of aerosol packed insecticides. Aerosol packaged goods have long been available to all income groups in the U.S.A. but in this country it was not until this summer, for the first time, that all the leading brands of aerosol-packaged insecticides and air-fresheners came down below the 5/- level. This opened up the huge lower-income group market to users of aerosol packaging. And there seems every chance that prices will continue to show the same downward trend.

These price reductions have served to convince a very wide public of the real practicability of the aerosol. It is no longer a gimmick; it is simple, sensible, understandable, workable. Manufacturers have been quick to realize this, and more and more products are being put out where the price is higher compared with the standard (in insecticides for example) but the usage is greater than before and the additional cost of them is accepted because of convenience, efficiency and ease of application. Sick room sprays—cold relief sprays—diesel engine starters and pharmaceutical aerosols are good examples of this, too. There is much more aerosol-consciousness from the public.

Seed Testing Facilities for Farmers —Seed Dressing Recommended

Farmers intending to use cereal seed of their own growing, or yearling seed which has been stored on the farm, are advised to have it tested first for germination; this is particularly important in the case of seed carried over from the 1958 harvest because of the difficult conditions under which the grain was harvested.

Farmers are also advised whenever possible, to use seed which has been treated with an officially approved seed dressing containing an organo-mercury fungicide. Last year the prevalence of certain seed-borne fungi, particularly on wheat and oats, caused failures in the field when organo-mercury fungicides were not used.

Lord Netherthorpe

In a personal letter to members of the N.F.U. Council, Lord Netherthorpe has stated that he has decided not to offer himself for re-election as President of the Union in 1960.

NEWS — SPRAYING

Power Sprayer Production

The Estimates, which are based on Manufacturers' returns collected by the Departments of Agriculture and the Board of Trade, of the Output of Agricultural Tractors and Machinery in the United Kingdom, reveal that, for the period January-March, 1959, production is almost double that of the corresponding period in 1958. The majority of machines have been for home use and the number of machines for export have dropped.

On the other hand the production of orchard sprayers shows a small total decrease although exports have increased. There has also been a significant increase in the production of scrub cutters, bracken breakers etc.

Actual figures are:

	1958		1959	
	Home	*Export*	*Home*	*Export*
Ground Crop Sprayers	1,400	204	3,040	130
Orchard Sprayers	171	86	92	126
Scrub Cutters, Bracken Breakers etc.	70	20	145	33

Solving the Spray Drift Problem

It is interesting to note that the question of damage through " hormone " drift has been the subject of a recent discussion in the House of Commons. The parliamentary Secretary to the Ministry of Agriculture, stated that providing toxic chemicals were properly used, they should present no major hazard. One of the main difficulties, however, is the damage resulting through the drift of hormone weedkillers and that research is now being conducted into spray pressures and new nozzle designs.

In connection with this statement, and the general concern throughout the farming community, with spray drift damage, the successful results which were obtained this year by using the new Dorman no-drift system of application, are very interesting.

Using the conventional type of sprayer with flat fan nozzles operating at from 30 to 40 lbs. p.s.i. pressure, the spray is produced by impacting a stream of liquid under high pressure through a restricting orifice. With the very sudden drop of pressure which occurs at the nozzle orifice, an unavoidable production of droplets of greatly differing sizes and weight results. The smaller droplets are drift prone and under conditions of even a light wind will give rise to drift which can cause serious damage to neighbouring susceptible crops.

The new nozzle, which produces the spray in the form of a hollow cone, has been designed to operate at very low pressures and for the low volume rates normally employed the recommended operating pressure is 10 to 15 lbs. p.s.i.

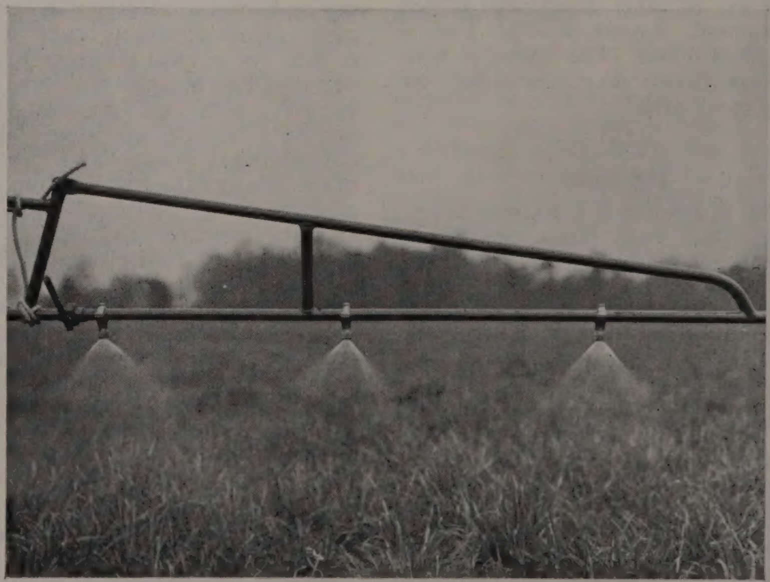
A rotary motion is imparted to the liquid in the nozzle chamber which produces a centrifugal force to the liquid, breaking it up into fine droplets on leaving the nozzle orifice.

A feature of the new nozzle is that at no point is there a sudden drop in pressure and the reduction of pressure occurs within the nozzle so that any fine droplets are re-absorbed before leaving the orifice. This has resulted in the production of a high degree of uniformity of droplet size and the almost entire elimination of the small, drift prone droplets which are a weakness of the flat fan nozzles and high pressure hollow cone nozzles previously employed in agriculture.

The new nozzle is arranged to fit the standard Dorman nozzle body so that the conversion of existing machines to the ultra-low pressure system can be carried out at very low cost. The conversion of all Dorman sprayers supplied over the last four years can be carried out without any alteration to the equipment and conversion kits are available for all models.

It is interesting to note that these nozzles, in addition to corn spraying, have been used in very restricted areas such as grass paths between flowering shrub boarders, and in forest land with excellent weed control results and no damage whatever to neighbouring susceptible plant life.

The Dorman Sprayer Co. Ltd., have not had one single complaint of drift damage where the no-drift system of application has been employed this year.



A close-up of the no-drift nozzles applying selective weed killer on grass

Insecta Laboratories Ltd.,
20 Havelock Road, Southampton.
Tel. No. Southampton 24325.

Ratsouris Ltd.,
104 West Broadway,
Westbury on Trym, Bristol.
Tel. No. Bristol 625275.

H. Tiffin & Son (Bournemouth) Ltd.,
Martins Bank Chambers,
49 Old Christchurch Road,
Bournemouth.
Tel. No. Bournemouth 6588.
(*Hampshire*)

Wales.*

Disinfestation Ltd.,
2 Lancaster Square,
Conway, N. Wales.
Tel. No. Conway 3254.
(*Anglesey, Caerns, Denbigh, Flint, Merioneth, Mont.*)

Disinfestation Ltd.,
16 High Street,
Cardiff, Glamorgan.
Tel. No. Cardiff 29867.
(*Brecknock, Cards., Carms., Glam., Mon., Pembs., Radnor.*)

Hivey Fumigation Co. Ltd.,
311 Grafton Street, Liverpool, 8.
Tel. No. Rouyal 6631.
(*Anglesey, Caerns., Denbigh., Flints., Merioneth., Mont.*)

Insecta Laboratories Ltd.,
174 Whiteladies Road, Bristol, 8.
Tel. No. Bristol 36428.

Insecta Laboratories Ltd.,
79 London Road, Manchester.
Tel. No. Ardwick 5614.

Ratsouris Ltd.,
104 West Broadway,
Westbury on Trym, Bristol.
Tel. No. Bristol 625275.
(*Brecknock., Cards., Carms., Glam., Mon., Pembs., Radnor.*)

Ratsouris Ltd.,
26 Victoria Street, Manchester, 3.
Tel. No. Stepping Hill 5030.
(*Caerns., Denbigh., Flint.*)

Ratsouris Ltd.,
112 Hamstead Road,
Birmingham, 20.
Tel. No. Northern 0976.
(*Merioneth., Mont.*)

**Services available in counties indicated. Where no county indicated services available in all counties in the Region.*

Scientex Ltd.,
Cadogan House, 12 West Bute St.,
Cardiff, Glamorgan.
Tel. No. Cardiff 28720.

Alphabetical List of Members of the Association making Warfarin and Warfarin Concentrates conforming to Ministry Specifications.

Firm	*Trade Mark*
British Insecticides Ltd., 11/13 Moscow Road, Bayswater, London, W.2. *Tel. No.* Bayswater 0033.	" KILRAPID " concentrates and baits.
Thomas Harley Ltd., Rodine Works, 55 South Methven Street, Perth. *Tel. No.* Perth 1036.	" RODINE " warfarin.
Keystone Chemical Co. Ltd., Keystone House, 14 Manor Place, Edinburgh, 3. *Tel. No.* Edinburgh 34968	" HAVOC " warfarin concentrates and baits.
The Murphy Chemical Co. Ltd., Wheathampstead, St. Albans, Hertfordshire. *Tel. No.* Wheathampstead 2233.	" MURPHEX " concentrates and baits.
Prior Chemicals Ltd., Picton Street, Lower Broughton, Manchester, 7. *Tel. No.* Deansgate 6546.	" PRIOR " warfarin and " DIRODE " warfarin baits.
Ratsouris Ltd., Golden Acre, 50 Central Street, London, E.C.1. *Tel. No.* Clerkenwell 3816.	" RIS " warfarin concentrates and baits.
Ridpests Ltd., 18 Andrew Street, London, E.14. *Tel. No.* East 2393.	Ridpests concentrates and baits.
Rodent Control Ltd., 46 Market Place, Reading, Berkshire. *Tel. No.* Reading 54536.	" R.C.R." warfarin concentrates.
Sorex (London) Ltd., 105 Tonbridge Road, Maidstone, Kent. *Tel. No.* Maidstone 2894.	" SOREXA " warfarin concentrates.

Record Chemical Co. Inc. moved into their new plant, located at 840 Montee de Liesse Road, Montreal 9, P.Q. Canada.

The firm was organised twelve years ago to manufacture and distribute insecticides. It started later to package various items for others in the insecticide, disinfectants, pharmaceutical field and is now heavily engaged in contract packaging and private label manufacturing, specialising in chemical specialities. The new Record Chemical Co. building is located in a rapidly expanding Northwestern industrial section of Montreal, located between Cote de Liesse Road and Cote Vertu. The building is constructed on 30,000 square feet of land and is 10,800 square feet in area, being of one storey it is modern and colourful. Offices, laboratories and manufacturing facilities are all under one roof so that the operation which used to be located at 410 St. Eloi St., 5071 St. Ambroise and 486 St. John St. is now combined under one roof.

Joseph Kuchar is President and the office staff has been re-organised.

Various items being packed for distributors and other manufacturers at present include all types of free-flowing powders, auto supplies, liquids and a complete line of insecticides.

Record Chemical Co. Inc. is equipped to handle long or short runs in dry powders, liquids and pastes in dry forms and pressing of larger tablets. Will store and drop-ship where this service is required.

Special rooms for inflammable materials have been installed and controlled air circulation has been included in the new plant according to specification to preclude mixing of odours. The company's land does not provide for a railroad siding but there is space available for future expansion. In the manufacturing programme of the company is the inclusion of types of disinfectants, deodorants, insecticides, soil fumigants, wood preservatives and home improvement products to the jobbers, private packaging for Drug, Hardware, Automotive and the household trade.

NEWS

Foot-and-Mouth Disease—an Additional Safeguard

As from 13th December, 1959, every consignment of meat and edible offal imported into Great Britain from the Argentine, Brazil, Chile and Uruguay will have to be certified by an authorised officer of the Government of the country of origin as having come from approved frigorificos (combined slaughtering and meat freezing plants). This is a further precaution taken by the Minister of Agriculture, Fisheries and Food and the Secretary of State for Scotland to prevent foot-and-mouth disease being brought into this country from South America.

Frigorificos approved by the Ministry are already regularly inspected by British veterinary officers stationed in South America.

Potato Blight

The Ministry of Agriculture, Fisheries and Food have announced that potato blight is now present on a few scattered main crops in most regions. This will be too late to cause loss of yield in the majority of the crops, many of which are already beginning to die down, but it may cause some loss of September growth in crops that are still fully green, and also cause some infection of tubers.

Arsenic on the Farm — a Serious Warning by M.A.F.F.

During the next few weeks, farmers will be lifting potatoes and some may decide to use arsenical sprays to kill off haulm and weeds; these sprays are highly toxic to all animals, and if it is considered absolutely essential to use them, the greatest care must be taken.

Before spraying, field fences must be made stockproof and livestock moved from down wind fields. Electric fences alone cannot be relied upon to keep out determined and inquisitive cattle. While spraying is in progress no unprotected person should be allowed in the field. Spray drift from any chemical spray is a nuisance but drift from an arsenical spray is especially dangerous. It must be prevented by all possible means: spraying should be done only in calm weather. After spraying, gates of fields of treated crops should be securely fastened and warning notices erected. Stock should be kept out of treated fields until the treated haulm and weeds have been completely burned in small heaps throughout the field.

Used containers should be washed out, punctured to prevent further use, and disposed of safely, for example, by burying or burning.

Asrenical sprays must never be used on any edible crop other than potatoes.

Use of Approved Chemical Agents for the Cleansing of Dairy Equipment

Approval has been given by the Minister of Agriculture, Fisheries and Food and the Minister of Health under the Milk and Dairies (General) Regulations 1959, for the use of the undermentioned products as chemical agents in the cleansing of dairy equipment.

Name of Product	*Name of Firm*
Kinray Hypochlorite (Agricultural Grade)	Reddish Chemical Co. Ltd. Globe Works, Stanley Road, Cheadle Hulme, Nr. Stockport, Cheshire.
Cheshire Detergent Sterilizer	Reddish Chemical Co. Ltd. Globe Works, Stanley Road, Cheadle Hulme, Nr. Stockport, Cheshire,
Stericlens	Bell & Sons Ltd. Gascoyne Street Liverpool, 3

Berkeley Square Invaded by Caterpillars—the Lady takes a Shower!

An army of marauding caterpillars recently invaded the plane trees in Berkeley Square, London. Office workers who regularly eat their lunches in the Square found caterpillars crawling all over the benches and even in their sandwiches.

Westminster City Council readily accepted an offer from a company manufacturing insecticide spraying machines, and the Pyrethrum Board of Kenya, to clear the Square.

A pyrethrum insecticide was selected for its quick-acting properties and because it would not harm the many birds which inhabit the area.

The fine insecticide spray, sent up to a height of 75 feet by an electric spraying machine, provided by Silver Creek Precision Corporation Ltd., had an immediate effect on the caterpillars—identified as those of the Common Vapourer Moth.

A pyrethrum insecticide is sprayed on to a caterpillar-covered statue in Berkeley Square.